Over The Wire Balloons Underutilized: A Novel Techniques For Older Devices

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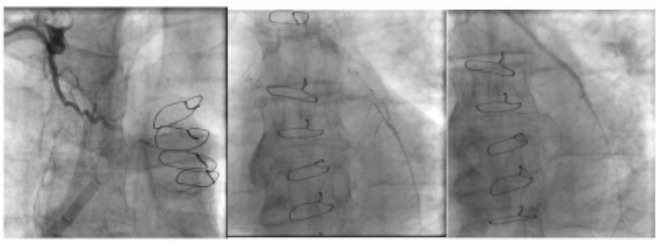
Abstract

Standard modality for crossing a stenotic lesion is using a wire to cross the lesion in a native or graft vessel. The area of interest beyond the lesion will generally be visualized by angiogram. However, in certain cases with acute to sub-acute occlusion with limited TIMI flow one may have difficulty in locating the site of stenosis. This may occur for example when there is a distal stenosis of a bypass graft or superimposed thrombus throughout a vessel. These types of lesions may lead to difficult decision making in regards to plan of treatment, and tend to lead to increased risk of complications and unsuccessful outcomes. Dissemination of simple safer technique will help to reduce complications during these types of procedures. We describe a novel technique of visualizing and locating such areas of stenosis demonstrated via two cases; one involving native and one involving graft vessels.

CASE REVIEW

Our first case is of an eighty four year old gentleman with history of coronary artery disease with three vessel coronary artery bypass grafts done seven years prior. The grafts included right internal mammary artery to left anterior descending artery, left internal mammary artery to the first obtuse marginal branch, and saphenous venous graft to posterior descending artery. He was evaluated in the outpatient setting for worsening angina despite maximal medical therapy and subsequently underwent a nuclear medicine stress test. The stress test suggested an anterior septal area of reversible ischemia. Following these results the patient was scheduled for coronary angiography.

Figure 1

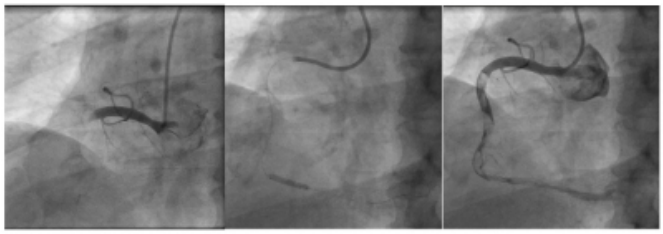


On cardiac angiography, total obstruction of the RIMA to LAD graft was seen with only the proximal area of the RIMA opacifying with contrast. There was absence of distal flow which precluded identifying the target lesion and its severity. After successfully placing an interventional wire from the RIMA to the LAD, flow was still not established. An over the wire balloon sized 2.0 x 12 mm was prepped and advanced down to the native LAD vessel via the RIMA. Serial dilation was done in five successive inflations at 6 atmospheres of pressure from the LAD up to the beginning of the RIMA. On angiography at this point, the site of stenosis was still not able to be determined as contrast only opacified till the mid portion of the RIMA (Figure 1a). Following this, over the wire balloon sized 2.5 x 15mm was prepped and advanced across the RIMA into the native vessel. The balloon was inflated to 10 ATM followed by fluoroscopy contrast injection while the balloon was still inflated. The balloon was deflated, pulled back approximately 3 cm at a time and this process was repeated. Upon reaching just proximal to the RIMA to LAD anastomosis, injection through the central port of the balloon identified the area of stenosis (Figure 1b). Following this, the balloon was withdrawn and a Drug Eluting Stent (DES) were successfully deployed with resultant TIMI III flow confirmed (Figure 1c).

In another case we describe a 68 year old male with past medical history of hypertension, cerebrovascular accident and hyperlipidemia who presented with progressive

exertional dyspnea and chest pain at rest. He was classified as unstable angina at the time and he subsequently underwent coronary angiography.

Figure 2



On angiography, the right coronary artery was a large diameter vessel which initially showed proximal complete stenosis (Figure 2). After successfully passing though the vessel with an interventional wire, multiple large thrombi were seen filling the mid and distal segments of the RCA. Subsequently up to 20 balloon inflations at a maximum pressure of 20 ATM throughout the vessel was administered. The area of stenosis was still not able to be appreciated at this time and the thrombus burden remained the same with TIMI 0 flow. A pronto extraction catheter with three passes made also failed to establish flow. Following this a 4.5x15 mm over the wire balloon was used. The balloon was pulled back gradually with inflation up to 20 ATM followed by fluoroscopy contrast injection while the balloon was still inflated. The balloon was deflated pulled back 2-3 centimeters at a time, followed by balloon inflation with subsequent contrast injection until the lesion was identified at the mid portion of the RCA. Subsequently a 4.5x20 mm bare metal stent was deployed in this area of stenosis. The patient was able to regain TIMI 1 flow but the thrombus burden remained. He was subsequently started on integrillin for the following 24 hours and decision was made to clinically monitor the patient for signs of ischemia. The decision was made not to take patient back for angiographic assessment as he remained symptom free for the duration of 48 hours. He was subsequently discharged on optimal medical therapy at that time.

DISCUSSION

Determining the location of a stenotic lesion can propose a challenge in the setting of a complete occlusion in a bypass graft or native coronary artery when dealing with multiple thrombi precluding the area of stenosis as described above. The issue with grafts is that there are no branching vessels as conduits for the contrast to flow, thus a distal lesion will not be apparent as the contrast will never reach this territory. This becomes more of a concern with RIMA and LIMA grafts. With thrombi being present, flow is limited and stenotic lesions with their anatomy and sizing beyond the lesion are not clearly visualized. The challenge in these cases and other similar clinical scenarios is the difficulty in determining the precise location for percutaneous coronary angioplasty with or without stent placement.

We offer a novel technique in determining the area of stenosis during coronary angiography. Our technique as described above uses an over the wire balloon. The balloon is inflated until it is occluding the vessel which is followed by contrast injection through the proximal port of the catheters lumen. By doing this, opacification of the area just distal to the balloon is now able to be visualized. The balloon is then deflated, withdrawn backward two to three centimeters and the above process is repeated. In doing this, one may be able to visualize five or more centimeter segments of the distal vessel at a time depending on the vessels caliber. In following this process, one will eventually be able to recognize the focal area of stenosis.

A literature review illustrated that balloon injection methods were employed in the setting of chronic total occlusions (1,2). Both reports utilized a similar technique of crossing a known lesion with an over-the-wire balloon catheter. This was followed by injecting contrast through the proximal end of the balloon catheter under fluoroscopy to achieve distal lumen visualization. However, in these reports the balloon was not inflated prior to injection of contrast, nor was this technique used to locate an area of stenosis. Instead the technique was used mainly to ensure the guiding wire was not in a false lumen. In one report (1) it assisted with confirmation of intraluminal position of the wire to help avoid iatrogenic dissection and in the latter case it was useful in ascertaining proper positioning of the angioplasty balloon (2). Other techniques have been described that used over the wire balloon inflation prior to chronic total occlusion to stabilize the interventional wire just proximal to the lesion of interest (3,4). In this situation, the balloon was intended to serve as an anchor support. Our technique offers the simplest way of approaching this unique challenge. It offers a benefit to the patient via improved chances for revascularization in a timely manner while decreasing the risk of complications with extended wire manipulation. This technique also leads to a benefit for the operators as fluoroscopic exposure will likely be decreased.

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